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EXAMINER

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PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

DETAILED ACTION

Response to Arguments

Applicant's arguments filed 11/20/07 have been fully considered but they are not persuasive. Three arguments were presented with respect to the claim rejections.

First, it was argued that a skilled artisan wouldn't combine Shibata and Kaneda because Kaneda teaches improving the lateral insulation of the anisotropic conductive adhesive (ACA) but an anisotropic conductive adhesive by definition only conducts electricity in a single direction. Therefore, why would one need to insulate in the lateral direction?

Please note that Kaneda teaches an ACA wherein the use of an insulated conductive particle improves the insulation in the lateral direction. Therefore, even though an ACA conducts in only one direction, this one way conduction can be improved by the use of an insulated conductive particle.

The second argument is that Shibata teaches using ultrasonic bonding without the use of heat while Kaneda requires heat in order to melt the insulation on the conductive particles so they can form a bond. Therefore, these references can't be combined.

Please note that Shibata teaches the ultrasonic bonding provides the heat required to form the bond through friction (4, 18+). Therefore, the heat required to melt the insulation on the conductive particles can be provided by the ultrasonic bonding of Shibata.

The final argument is that Shibata teaches the formation of a eutectic alloy through the use of an Au bump, therefore one can't substitute Cu for Au.

Please note that Cu can form an eutectic alloy, such Al/Cu and Sn/Ag/Cu alloys. therefore, Cu can be substituted for Au and form an eutectic alloy.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

Claim 1, 2, 4, 5, and 7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Shibata, US Patent 6,461,890 in view of Kaneda et al., US Patent 6,223,429.

Shibata (Figures 5 & 6) teaches a wafer-level chip scale package, comprising:
a chip [10] containing a stud bump [11];
a leadframe substrate [60] containing a bond pad [61]; and

an adhesive material [30] containing conductive particles [32] located between the chip and the substrate.

Shibata fails to teach the conductive particles comprise metal with an insulating layer.

Kaneda (6, 35+) teaches the conductive particles comprise metal with an insulating layer.

It would have been obvious to one of ordinary skill in the art at the time of the invention to use the conductive particles of Kaneda in the invention of Shibata because Kaneda teaches conductive particles comprising metal with an insulating layer improves insulating properties in the lateral direction of metal particles (6, 35+).

Regarding claim 2, Shibata teaches at least one conductive particle is located between the stud bump and the bond pad (figure 6).

With respect to claim 4, Shibata teaches the adhesive material comprises an anisotropic conductive film, an anisotropic conductive paste, or an isotropic conductive paste (7, 64+).

As to claim 5, Shibata teaches the chip contains an integrated circuit in communication with a chip pad (7, 44+).

In re claim 7, Shibata, which teaches the bump is made of gold (7, 45+), teaches the package does not contain any solder paste.

Claim 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over Shibata, US Patent 6,461,890, as applied to claim 1 above, and further in view of Applicant's admitted prior art APA Figures 1-3.

Shibata fails to teach the chip contains a re-distributed line (RDL) pattern and an insulating layer covering a portion of the RDL pattern.

APA teaches the chip contains a re-distributed line (RDL) pattern and an insulating layer covering a portion of the RDL pattern.

It would have been obvious to one of ordinary skill in the art at the time of the invention to use the RDL of APA in the invention of Shibata because RDL patterns allow for greater flexibility and take advantage of unused chip space.

Claims 8-10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Shibata, US Patent 6,461,890, as applied to claim 1 above.

Regarding claim 8, while Shibata, which teaches the use of gold (Au) bumps (7, 45+), fails to teach the stud bump comprises Cu, it would have been obvious to one of ordinary skill in the art at the time of the invention to use Cu in the invention of Shibata because Au and Cu are materials known to a skilled artisan to be equivalent. Both are well known in the art materials used as bumps, as taught by Tummala et al., Microelectronics Packaging Handbook: Semiconductor Packaging - Part II, 1997, pp II-207. The substitution of one known equivalent technique for another may be obvious even if the prior art does not expressly suggest the substitution (Ex parte Novak 16 USPQ 2d 2041 (BPAI 1989); In re Mostovych 144 USPQ 38 (CCPA 1964); In re Leshin 125 USPQ 416 (CCPA 1960); Graver Tank & Manufacturing Co. V. Linde Air Products Co. 85 USPQ 328 (USSC 1950).

With respect to claim 9, while Shibata fails to teach the stud bump is a coined stud bump, it would have been obvious to one of ordinary skill in the art at the time of

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the invention to use a coined stud bump in the invention of Shibata because the use of a stud bump or a coined stud bump are equivalent. A skilled artisan knows that each are commonly known and used bumps to interconnect a die to a substrate, as taught by Lau, Flip Chip Technologies, 1996, pp. 129-131. The substitution of one known equivalent technique for another may be obvious even if the prior art does not expressly suggest the substitution (Ex parte Novak 16 USPQ 2d 2041 (BPAI 1989); In re Mostovych 144 USPQ 38 (CCPA 1964); In re Leshin 125 USPQ 416 (CCPA 1960); Graver Tank & Manufacturing Co. V. Linde Air Products Co. 85 USPQ 328 (USSC 1950).

As to claim 10, while Shibata fails to teach the chip does not contain a chip pad overlying an integrated circuit (IC), this is an obvious matter of design choice. Design choices and changes of size are generally recognized as being within the level of ordinary skill in the art (MPEP 2144.04(I), (IVA) & (IVB)). Placement of the chip pad relative to the IC is known to a skilled artisan since placing it away from the chip pad protects the IC from the heat and pressure put upon the pad.

Claims 11, 12, and 14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Shibata, US Patent 6,461,890, in view of Kaneda et al., US Patent 6,223,429.

Shibata (figure 5) teaches a wafer-level chip scale package, comprising:

a chip [10] containing a stud bump [11];

a substrate [60] containing a bond pad [61]; and

an adhesive material [30] containing conductive particles [32] located between the chip and the substrate with at least one conductive particle contacting both the stud bump and the bond pad.

While Shibata, which teaches the use of gold (Au) bumps (7, 45+), fails to teach the stud bump comprises Cu, it would have been obvious to one of ordinary skill in the art at the time of the invention to use Cu in the invention of Shibata because Au and Cu are materials known to a skilled artisan to be equivalent. Both are well known in the art materials used as bumps, as taught by Tummala et al., Microelectronics Packaging Handbook: Semiconductor Packaging - Part II, 1997, pp 11-207. The substitution of one known equivalent technique for another may be obvious even if the prior art does not expressly suggest the substitution (Ex parte Novak 16 USPQ 2d 2041 (BPAI 1989); In re Mostovych 144 USPQ 38 (CCPA 1964); In re Leshin 125 USPQ 416 (CCPA 1960); Graver Tank & Manufacturing Co. V. Linde Air Products Co. 85 USPQ 328 (USSC 1950).

Further, Shibata fails to teach the conductive particles comprise metal with an insulating layer.

Kaneda (6, 35+) teaches the conductive particles comprise metal with an insulating layer.

It would have been obvious to one of ordinary skill in the art at the time of the invention to use the conductive particles of Kaneda in the invention of Shibata because Kaneda teaches conductive particles comprising metal with an insulating layer improves insulating properties in the lateral direction of metal particles (6, 35+).

Regarding claim 12, Shibata teaches the adhesive material comprises an anisotropic conductive film, an anisotropic conductive paste, or an isotropic conductive paste (7, 64+).

With respect to claim 14, Shibata, which teaches the bump is made of gold (7, 45+), teaches the packaged device does not contain solder paste.

Claim 13 is rejected under 35 U.S.C. 103(a) as being unpatentable over Shibata, US Patent 6,461,890, in view of Kaneda et al., US Patent 6,223,429, as applied to claim 11 above, and further in view of APA Figures 1-3.

Shibata fails to teach the chip contains a re-distributed line (RDL) pattern and an insulating layer covering a portion of the RDL pattern.

APA teaches the chip contains a re-distributed line (RDL) pattern and an insulating layer covering a portion of the RDL pattern.

It would have been obvious to one of ordinary skill in the art at the time of the invention to use the RDL of APA in the invention of Shibata because RDL patterns allow for greater flexibility and take advantage of unused chip space.

Claims 15, 16, and 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Shibata, US Patent 6,461,890, in view of Kaneda et al., US Patent 6,223,429.

Shibata (figure 5) teaches a wafer-level chip scale package, comprising:
a chip [10] containing a stud bump [11];
a leadframe substrate [60] containing a bond pad [61]; and

an adhesive material [30] containing conductive particles [32] located between the chip and the substrate with at least one conductive particle contacting both the stud bump and the bond pad.

While Shibata, which teaches the use of gold (Au) bumps (7, 45+), fails to teach the stud bump comprises Cu, it would have been obvious to one of ordinary skill in the art at the time of the invention to use Cu in the invention of Shibata because Au and Cu are materials known to a skilled artisan to be equivalent. Both are well known in the art materials used as bumps, as taught by Tummala et al., *Microelectronics Packaging Handbook: Semiconductor Packaging - Part II*, 1997, pp 11-207. The substitution of one known equivalent technique for another may be obvious even if the prior art does not expressly suggest the substitution (*Ex parte Novak* 16 USPQ 2d 2041 (BPAI 1989); *In re Mostovych* 144 USPQ 38 (CCPA 1964); *In re Leshin* 125 USPQ 416 (CCPA 1960); *Graver Tank & Manufacturing Co. V. Linde Air Products Co.* 85 USPQ 328 (USSC 1950).

Further, Shibata fails to teach the conductive particles comprise metal with an insulating layer.

Kaneda (6, 35+) teaches the conductive particles comprise metal with an insulating layer.

It would have been obvious to one of ordinary skill in the art at the time of the invention to use the conductive particles of Kaneda in the invention of Shibata because Kaneda teaches conductive particles comprising metal with an insulating layer improves insulating properties in the lateral direction of metal particles (6, 35+).

Regarding claim 16, Shibata teaches the adhesive material comprises an anisotropic conductive film, an anisotropic conductive paste, or an isotropic conductive paste (7, 64+).

With respect to claim 18, Shibata, which teaches the bump is made of gold (7, 45+), teaches the packaged device does not contain solder paste.

Claim 17 is rejected under 35 U.S.C. 103(a) as being unpatentable over Shibata, US Patent 6,461,890, in view of Kaneda et al., US Patent 6,223,429, as applied to claim 15 above, and further in view of APA Figures 1-3.

Shibata fails to teach the chip contains a re-distributed line (RDL) pattern and an insulating layer covering a portion of the RDL pattern.

APA teaches the chip contains a re-distributed line (RDL) pattern and an insulating layer covering a portion of the RDL pattern.

It would have been obvious to one of ordinary skill in the art at the time of the invention to use the RDL of APA in the invention of Shibata because RDL patterns allow for greater flexibility and take advantage of unused chip space.

Claim 19 is rejected under 35 U.S.C. 103(a) as being unpatentable over Shibata, US Patent 6,461,890, in view of Kaneda et al., US Patent 6,223,429.

Shibata (figure 5) teaches an electronic apparatus containing a packaged semiconductor device without solder paste (7, 45+), the device comprising:

a chip [10] containing a stud bump [11];

a leadframe substrate [60] containing a bond pad [61]; and

an adhesive material [30] containing conductive particles [32] contacting both the chip and the substrate.

Shibata fails to teach the conductive particles comprise metal with an insulating layer.

Kaneda (6, 35+) teaches the conductive particles comprise metal with an insulating layer.

It would have been obvious to one of ordinary skill in the art at the time of the invention to use the conductive particles of Kaneda in the invention of Shibata because Kaneda teaches conductive particles comprising metal with an insulating layer improves insulating properties in the lateral direction of metal particles (6, 35+).

Claims 33, 34, and 36 are rejected under 35 U.S.C. 103(a) as being unpatentable over Shibata, US Patent 6,461,890, in view of Kaneda et al., US Patent 6,223,429.

Shibata teaches a wafer-level chip scale packaged semiconductor device, the device comprising:

a chip [10] containing a stud bump [11];

a substrate [60] containing a bond pad [61]; and

an adhesive material [30] containing conductive particles [32] located between the chip and the substrate.

Shibata fails to teach the conductive particles comprise metal with an insulating layer.

Kaneda (6, 35+) teaches the conductive particles comprise metal with an insulating layer.

It would have been obvious to one of ordinary skill in the art at the time of the invention to use the conductive particles of Kaneda in the invention of Shibata because Kaneda teaches conductive particles comprising metal with an insulating layer improves insulating properties in the lateral direction of metal particles (6, 35+).

Regarding claim 34, Shibata teaches the adhesive material' comprises an anisotropic conductive film, an anisotropic conductive paste, or an isotropic conductive paste (7, 64+).

With respect to claim 36, Shibata, which teaches the bump. is made of gold (7, 45+), teaches the packaged device does not contain solder paste.

Claim 35 is rejected under 35 U.S.C. 103(a) as being unpatentable over Shibata, US Patent 6,461,890, in view of Kaneda et al., US Patent 6,223,429, as applied to claim 33 above, and further in view of APA Figures 1-3.

Shibata fails to teach the chip contains a re-distributed line (RDL) pattern and an insulating layer covering a portion of the RDL pattern.

APA teaches the chip contains a re-distributed line (RDL) pattern and an insulating layer covering a portion of the RDL pattern.

It would have been obvious to one of ordinary skill in the art at the time of the invention to use the RDL of APA in the invention of Shibata because RDL patterns allow for greater flexibility and take advantage of unused chip space.

Claims 37, 38, and 40 are rejected under 35 U.S.C. 103(a) as being unpatentable over Shibata, US Patent 6,461,890, in view of Kaneda et al., US Patent 6,223,429.

Shibata (Figures 5 & 6) teaches an electronic apparatus containing a wafer-level chip scale packaged semiconductor device, comprising:

- a chip [10] containing a stud bump [11];
- a leadframe substrate [60] containing a bond pad [61]; and
- an adhesive material [30] containing conductive particles [32] located between the chip and the substrate.

Shibata fails to teach the conductive particles comprise metal with an insulating layer.

Kaneda (6, 35+) teaches the conductive particles comprise metal with an insulating layer.

It would have been obvious to one of ordinary skill in the art at the time of the invention to use the conductive particles of Kaneda in the invention of Shibata because Kaneda teaches conductive particles comprising metal with an insulating layer improves insulating properties in the lateral direction of metal particles (6, 35+).

Regarding claim 38, Shibata teaches the adhesive material comprises an anisotropic conductive film, an anisotropic conductive paste, or an isotropic conductive paste (7, 64+).

With respect to claim 40, Shibata, which teaches the bump is made of gold (7, 45+), teaches the packaged device does not contain solder paste.

Claim 39 is rejected Shibata, US Patent 6,461,890, in view of Kaneda et al., US Patent 6,223,429, as applied to claim 37 above, and further in view of APA Figures 1-3.

Shibata fails to teach the chip contains a re-distributed line (RDL) pattern and an insulating layer covering a portion of the RDL pattern.

APA teaches the chip contains a re-distributed line (RDL) pattern and an insulating layer covering a portion of the RDL pattern.

It would have been obvious to one of ordinary skill in the art at the time of the invention to use the RDL of APA in the invention of Shibata because RDL patterns allow for greater flexibility and take advantage of unused chip space.

Claims 41,42, 44, and 45 are rejected under 35 U.S.C. 103(a) as being unpatentable over Shibata, US Patent 6,461,890, in view of Kaneda et al., US Patent 6,223,429.

Shibata (figure 5) teaches a wafer-level chip scale package without solder paste (7, 45+), comprising:

- a chip [10] containing a stud bump [11];

- a leadframe substrate [60] containing a bond pad [61]; and

- an adhesive material [30] containing conductive particles [32] located between the chip and the substrate, wherein a conductive particle contacts both the stud bump and the bond pad.

Shibata fails to teach the conductive particles comprise metal with an insulating layer.

Kaneda (6, 35+) teaches the conductive particles comprise metal with an insulating layer.

It would have been obvious to one of ordinary skill in the art at the time of the invention to Use the conductive particles of Kaneda in the invention of Shibata because Kaneda teaches conductive particles comprising metal with an insulating layer improves insulating properties in the lateral direction of metal particles (6, 35+).

Regarding claim 42, Shibata teaches the adhesive material comprises an anisotropic conductive film, an anisotropic conductive paste, or an isotropic conductive paste (7, 64+).

With respect to claim 44, while Shibata, which teaches the use of gold (Au) bumps (7, 45+), fails to teach the stud bump comprises Cu, it would have been obvious to one of ordinary skill in the art at the time of the invention to use Cu in the invention of Shibata because Au and Cu are materials known to a skilled artisan to be equivalent. Both are well known in the art materials used as bumps, as taught by Tummala et al., Microelectronics Packaging Handbook: Semiconductor Packaging - Part II, 1997, pp II-207. The substitution of one known equivalent technique for another may be obvious even if the prior art does not expressly suggest the substitution (Ex parte Novak 16 USPQ 2d 2041 (BPAI 1989); In re Mostovych 144 USPQ 38 (CCPA 1964); In re Leshin 125 USPQ 416 (CCPA 1960); Graver Tank & Manufacturing Co. V. Linde Air Products Co. 85 USPQ 328 (USSC 1950).

As to claim 45, while Shibata fails to teach the stud bump is a coined stud bump, it would have been obvious to one of ordinary skill in the art at the time of the invention

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to use a coined stud bump in the invention of Shibata because the use of a stud bump or a coined stud bump are equivalent. A skilled artisan knows that each are commonly known and used bumps to interconnect a die to a substrate, as taught by Lau, Flip Chip Technologies, 1996, pp. 129-131. The substitution of one known equivalent technique for another may be obvious even if the prior art does not expressly suggest the substitution (Ex parte Novak 16 USPQ 2d 2041 (BPAI 1989); In re Mostovych 144 USPQ 38 (CCPA 1964); In re Leshin 125 USPQ 416 (CCPA 1960); Graver Tank & Manufacturing Co. V. Linde Air Products Co. 85 USPQ 328 (USSC 1950).

Claim 43 is rejected under 35 U.S.C. 103(a) as being unpatentable over Shibata, US Patent 6,461,890, in view of Kaneda et al., US Patent 6,223,429, as applied to claim 41 above and further in view of APA Figures 1-3.

Shibata fails to teach the chip contains a re-distributed line (RDL) pattern and an insulating layer covering a portion of the RDL pattern.

APA teaches the chip contains a re-distributed line (RDL) pattern and an insulating layer covering a portion of the RDL pattern.

It would have been obvious to one of ordinary skill in the art at the time of the invention to use the RDL of APA in the invention of Shibata because RDL patterns allow for greater flexibility and take advantage of unused chip space.

Conclusion

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to David A. Zarneke whose telephone number is (571)-272-1937. The examiner can normally be reached on M-Th 7:30 AM-6 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, William Baumeister can be reached on (571)-272-1722. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/David A. Zarneke/
Primary Examiner
January 27, 2008